

REMARKS

Reconsideration is respectfully requested. Claims 29-32, 35-38, 40, 43-44, 65-70, and 76-90 have been amended. Claim 1-28, 50-64, and 71-72 have been cancelled. Claims 47-49 have been withdrawn. After entry of this amendment claims 29-46, 65-70, and 73-94 will be pending.

Restriction Requirement

Applicants confirm the election with traverse to prosecute the invention of group I. The applicants hereby traverse the restriction requirement. Group I drawn to nucleic acids, vectors, host cells, plants, seeds, and methods of expressing polypeptides and Group II drawn to polypeptides are not distinct from one another. The polypeptides are those expressed from the nucleic acids. While physically distinct, there is a clear sequence relationship between the two and as such searching on nucleic acids and the polypeptides expressed from those nucleic acids will yield essentially the same search results. Therefore there is no additional burden on the patent office in search these two groups. Thus applicants respectfully request that the Examiner withdraw the restriction requirement.

Objections to the Specification

The Examiner has objected to the specification for the presence of embedded hyperlinks. The amendment to the specification removes the hyperlinks. As such, applicants request that the objection to the specification be withdrawn.

Sequence listing

A paper copy of the sequence listing with a statement that the paper copy and the electronic copy are the same have been submitted with this response.

Claim Objections

The Examiner has objected to claims 29-46, 65-70 and 73-94 because the independent claims include the recitation “a sequence set forth in figure 5A.” The claims have been amended to remove the citation to figures.

The Examiner has objected to claim 43 because of the recitation “he”. The claim has been amended to “the”.

In light of the amendments to the specifications and claims, applicants respectfully request that the Examiner withdraw the objections.

Claim Rejections – 35 U.S.C. § 112, Second Paragraph

The Examiner has rejected claims 29-46, 65-70, and 73-94 as being indefinite for failing to particularly point out and distinctly claim the subject matter that applicants regard as their invention. Specifically, the Examiner has stated that the recitation citing to figures is unclear.

Applicants respectfully disagree with the Examiner’s grounds for rejection. However, in order to facilitate prosecution in this case applicants have amended the pending claims, without prejudice or disclaimer, to clarify and remove the citation to figures.

In light of the above amendments and remarks, the applicants respectfully request that the examiner withdraw the rejections based upon 35 U.S.C. § 112, Second Paragraph.

Claim Rejections – 35 U.S.C. § 112, First Paragraph

The Examiner has rejected claims 29-31, 33-46, 65-70, 73-74, 76-77, 79-80, 82-83, 88-89, and 91-94 under 35 U.S.C. § 112, first paragraph as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The Examiner has stated that the lack of a claimed function renders the claims indefinite.

Applicants respectfully disagree with the Examiner's grounds for rejection. However, in order to facilitate prosecution in this case applicants have amended the pending claims, without prejudice or disclaimer, to clarify and remove the citation to figures. The name of the protein is "an NTR protein" as recited in the claims and the name of the protein itself indicates the function; however, the claims have been amended to further clarify the function of the proteins encoded by the nucleic acid without altering the scope of the claims.

With respect to highly stringent hybridization, the specification clearly conveys to one of skill in the art that the inventor had possession of the claimed invention. The USPTO has published a document providing specific examples of application of the written description – "SYNOPSIS OF APPLICATION OF WRITTEN DESCRIPTION GUIDELINES". (Available online at: <http://www.uspto.gov/web/menu/written.pdf>). The SYNOPSIS has an example that is squarely on point. Example 9, pages 35-37, covers hybridization claims such as in the instant application. As in the example, applicants disclose a single cDNA, SEQ ID NO:10 which as amended has a defined function – NTR biological activity, which is defined in the specification on page 15, lines 15-16. The example states that, "The Art indicates that hybridization techniques using a known DNA as a probe under highly stringent conditions were conventional in the art at the time of filing." (SYNOPSIS at page 36) At the time of filing of the instant application, hybridization techniques were well known. Applicants claims are drawn to a genus of nucleic acids all of which must hybridize with SEQ ID NO:10 and must encode a protein with a specific activity just as in the Example. The Examiner has indicated that the prior art fails to teach or suggest an isolated nucleic acid of SEQ ID NO:10 just as in the Example. Applicants disclose one species that is within the scope of the claimed genus and therefore have actual reduction to practice of at least one disclosed species just as in the Example. The Example states, "a person of skill in the art would not expect substantial variation among species encompassed within the scope of the claims because the highly stringent conditions set forth in the claim yield structurally similar DNAs. Thus, a representative number of species is disclosed, since the highly stringent hybridization conditions in combination with the coding function of the

DNA and the level of skill and knowledge in the art are adequate to determine that applicant was in possession of the claimed invention.” (SYNOPSIS pages 36-37). Thus, clearly, applicants have adequately described the claimed invention and had possession of the invention as of filing the application.

With respect to nucleic acids that have 75% identity with SEQ ID NO:10, the claims have been amended to nucleic acids with 95% identity that encode an NTR with NTR biological activity, the specification clearly conveys to one of skill in the art that the inventor had possession of the claimed invention. Similar to Example 9 in the SYNOPSIS, nucleic acids that are 95% identical to SEQ ID NO:10 will be structurally similar to SEQ ID NO:10. Since there is a clear structural relationship with a defined functional relationship to the disclosed embodiment (SEQ ID NO:10), one of skill in the art would recognize that the inventors had possession of the claimed invention as of filing the application.

The Examiner has rejected claims 29-31, 33-46, 65-70, 73-74, 76-77, 79-80, 82-83, 85-86, 88-89, and 91-94 under 35 U.S.C. § 112, first paragraph as allegedly failing to enable a nucleic acid that hybridizes under high stringency to SEQ ID NO:10 and have some percentage sequence identity to SEQ ID NO:10.

Applicants respectfully disagree with the Examiner’s grounds for rejection.

To satisfy the enablement requirement, a specification must contain sufficient information regarding the claimed subject matter as to enable one of ordinary skill in the art to make and use the invention as claimed. MPEP § 2164.01. This issue is addressed by asking the question of whether one of ordinary skill in the art could make and use the invention without “undue experimentation.” The factors for assessing whether undue experimentation is required are listed in MPEP § 2164.01(a).

With respect to highly stringent hybridization, the specification provides conditions on page 21, lines 3-15, for highly stringent hybridization as is claimed. Testing hybridization under such conditions is a routine matter for one of skill in the art. Furthermore, as indicated in

Example 9 of the SYNOPSIS discussed above: “a person of skill in the art would not expect substantial variation among species encompassed within the scope of the claims because the highly stringent conditions set forth in the claim yield structurally similar DNAs.” Thus, the claims are not drawn to a broad range of nucleic acids. The claims are further limited by the requirement that the protein encoded must have NTR biological activity. Testing the protein expressed from the gene for such activity requires only routine screening of the protein for its ability to catalytically reduce thioredoxin coupled to NADPH oxidation. Thus, the scope of the claims is not unduly broad and the experiments required are all routine.

Furthermore, the skill in the art is high. Such work is performed by scientists at a graduate or post-doctoral level. The state of the prior art is advanced. As mentioned above, testing hybridization is a routine matter in the art. In addition, as of filing the application, transformation of plants was well developed. Expressing a gene in any particular plant is fairly predictable. The Examiner has suggested that the unpredictability of what the exact sequences that will have the claimed function renders the claims not enabled. This cannot be the standard by which enablement is determined. By way of analogy, claims to antibodies that bind to a given protein are well established as allowable where the protein is novel, but no one of ordinary skill in the art can predict the sequence of even one antibody, much less every possible antibody that could bind to the protein. Rather such claims are considered enabled, because the routine protocols of immunization, generation of monoclonals, and screening such monoclonals for their ability to bind to the given protein are in theory sufficient to generate every possible antibody and therefore enable one of skill in the art to make and use the invention commensurate in scope with the claims. Similarly, with the claimed invention in the present application, routine protocols available would enable one of skill in the art to isolate nucleic acids that bind to SEQ ID NO:10 with high stringency or have 95% identity to SEQ ID NO:10 and then screen the protein encoded by such nucleic acids for NTR biological activity. These routine protocols are sufficient to allow one of ordinary skill in the art to make and use the claimed invention commensurate in scope with the claims. It is irrelevant that one of skill in the art could not

predict with 100% accuracy which sequences will have the claimed function otherwise claims to antibodies would not be allowable because one of skill in the art could not predict with 100% accuracy which antibody sequences would bind to a given protein.

Thus, the invention as claimed is enabled because the breadth of the claims is reasonably narrow; the state of the prior art is well developed for techniques of molecular biology, enzymology, plant transformation and gene expression; the disclosure in the instant specification provides reasonable predictability; the level of skill in the art is high; the specification provides specific working examples, and the quantity of experimentation is not undue.

Therefore, applicants respectfully request that the Examiner withdraw the enablement rejections.

Claim Rejections – 35 U.S.C. § 102

The Examiner has rejected claims 29-35, 41-42, 46, 65-68, 73-78, 91, and 94 as being anticipated by Lalgudi *et al.* (US Pat. No. 6476212).

Applicants respectfully disagree with the Examiner's rejection. In order to anticipate, the reference must teach every element of the claims. The claims have been amended to clarify that the proteins encoded by the nucleic acids have NTR biological activity. One of skill in the art would not believe that the fragment disclosed in Lalgudi would have the requisite NTR biological activity. Bob Buchanan supports this view in his declaration submitted with this response (the Buchanan Declaration). As indicated in Buchanan Declaration, the fragment lacks the active site of the enzyme, lacks the NADPH binding motif and lacks one of the two FAD binding motifs. Without an active site, the fragment will not function. Thus, Lalgudi fails to teach a nucleic acid encoding a protein with NTR biological activity.

Furthermore, the claims to nucleic acids with percent identity have been amended to recite 95% identity, so the fragment that has 89% identity no longer falls within the scope of the claims.

The Examiner has rejected claims 29-35, 41-42, 46, 65-68, 73-78, 91, and 94 as being anticipated by Jacquot *et al.* (J. Mol. Biol. (1994) 235, 1357-1363). Applicants have amended these claims to remove the citation to Figure 5A and now only reference SEQ ID NO:10 or SEQ ID NO:9. Thus, Jacquot *et al.* does not anticipate the claims because it fails to teach an element of the claims as now amended.

Claim Rejections – 35 U.S.C. § 103

A. The Examiner's Rejections

The Examiner has rejected claims 36-40, 43-45, 69-70, 79-90, and 92-93 under 35 U.S.C. § 103(a) as being unpatentable over Jacquot *et al.* in view of Shi *et al.* (Plant Molecular Biology 23:653-662, 1996).

B. The Claimed Invention

The invention as claimed includes a nucleic acid that hybridizes to SEQ ID NO:10, 26, and 27 at high stringency or a nucleic acid having at least 95% sequence identity to SEQ ID NO:10, 26, and 27 in a plant, plant cell, or plant seed.

C. Cited References

Jacquot *et al.* teach the nucleic acid encoding the Arabidopsis NADPH-dependent thioredoxin reductase (NTR). Jacquot *et al.* teach a host cell (*E. coli*) comprising such nucleic acid and recovery of protein expressed from such nucleic acid. Jacquot *et al.* do not teach transgenic plants which comprise the NTR encoding nucleic acids or constructs. Shi *et al.* teach transgenic plants expressing recombinant thioredoxin.

D. Cited References Distinguished

35 USC 103(a) states “a patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences

between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to person having ordinary skill in the art to which said subject matter pertains. The *prima facie* case must satisfy three requirements: 1) the references must teach or suggest all the claim limitations; 2) the prior art combined with general knowledge must include a suggestion or incentive to modify or combine the references; and 3) the modification or combination must have a reasonable chance of success.

The Examiner fails to establish a *prima facie* case for obviousness in the above rejection. Specifically, the Examiner has not cited to a motivation or suggestion to combine the cited references. The MPEP is clear that a suggestion or motivation is not just any comment that modification of a reference or combination of references could be done. See MPEP 2143.01, "The prior art must suggest the desirability of the claimed invention." The Examiner has stated that the motivation would be to express the protein in an alternate system. This motivation is not found in either reference. Jacquot *et al.* expressed the protein in *E. coli* and even indicated that the protein expression in *E. coli* was very efficient (See page 1361, col 1), but did not suggest even the general desirability of expressing the protein in any other system, much less the specific desirability of expressing the protein in plants. Shi *et al.* also fail to provide any motivation to express the NTR protein of Jacquot *et al.* in the expression system disclosed in Shi *et al.*

In addition, the Examiner has indicated that one of ordinary skill in the art would be motivated to express the NTR in plants to study the Arabidopsis protein in plant. Again, neither Jacquot *et al.* nor Shi *et al.* suggest such an experiment for further characterization of the enzyme. Even if they do suggest the further characterization of the enzyme, the Examiner has selected one of a nearly limitless number of experiments that one of skill in the art might select to further characterize the enzyme. Neither reference suggests the particular experiment that the Examiner has proposed. Absent some suggestion or teaching in either Jacquot *et al.* or Shi *et al.* that it would be desirable to express the nucleic acid in plant, i.e., the claimed invention, there is no *prima facie* case of obviousness.

Applicants therefore respectfully request that the Examiner withdraw the obviousness rejection.

CONCLUSION

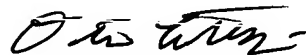
In light of the above amendments and remarks, applicants submit that the pending claims are in condition for allowance. Should there be any remaining issues that remain unresolved, the Examiner is encouraged to contact the undersigned by telephone.

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Assistant Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 416272001410. However, the Assistant Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Respectfully submitted,

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By:



Otis B. Littlefield
Registration No. 48,751

Morrison & Foerster LLP
425 Market Street
San Francisco, California 94105-2482
Telephone: (415) 268-6846
Facsimile: (415) 268-7522